weighted the coach. Small brains have been strained further than they should be; a smattering rather than a real grounding in knowledge, and a "cramming" rather than a forming of character, have been given. He hopes that the revival of the interest in secondary education is a sign that we are going to mend our ways in these directions. My own belief, he continued, is that the proper form for education to take is to teach very few subjects in the elementary schools and to teach them thoroughly. Then, instead of wasting time in making a level of mediocrity, let promising children be taken out of the elementary schools, and, when they are really likely to profit by superior and special instructions, bring them into secondary schools. All the population who show that they are able to profit by the advantages of secondary education should receive it. Some of the money spent on elementary education might be saved and spent on technical education.

PROF. SCHUSTER has offered to the University of Manchester during the next three or four years an annual sum of 350*l.* as the stipend of a reader in mathematical physics. The council and senate have accepted with great gratification Prof. Schuster's generous gift, and the post will be instituted forthwith. The reader will be attached to the department of physics. His primary duty will be the promotion of research in the subject of mathematical physics, but he may also be called upon to give a course of lectures on the subject. Prof. Schuster, in a letter to the Vice-Chancellor, gave his reasons for making his offer, as follows:—"I have been watching for some time with considerable apprehension the growing separation between the subjects of mathematical and experimental physics This separation followed perhaps naturally on the rapid growth and exceptional success of the experimental side during the last twenty years, but it cannot, in my opinion, fail to be detrimental to the further progress of the science. I have been trying in the physics honours school of our university to give equal weight to the two branches of the subject, and the offer I now make is intended to emphasise the close connection which should exist between experimental and theoretical work. I believe that at the present moment the foundation of such a readership as I contemplate would be of advantage to science generally and to our school of physics."

MR. E. B. SARGANT, education adviser to the High Commissioner of South Africa, read a paper at the meeting of the Royal Colonial Institute on January 15 on federal tendencies in education. Among other subjects of educational importance, Mr. Sargant dealt with movements especially characteristic of higher education, such as the unceasing stream of young men of good circumstances which flows from the various parts of Greater Britain through our ancient universities, a movement which, in the case of Oxford, was so powerfully reinforced by the bequest of the late Mr. Rhodes. From the point of view of our larger national character, it is difficult to put too great a value upon the influence exerted by such a circulation of students through the heart of our higher educational system. He then spoke of the need of reproducing this kind of education in the colonies themselves, and said that our great public schools and colleges ought to realise that at no distant date they may themselves be asked to extend into Greater Britain. Mr. Sargant also discussed the federal stimulus in education, of which the London University, in its purely examinational aspect, must be considered to be a first cause, and observed that, from an Imperial point of view, the University of London has centred the thoughts of many of our fellow-subjects in all parts of the British Dominions upon the value of some unity of educational aim, even though it may be only a unity of standard. In the discussion which followed, Sir A. Rücker pointed out that in any dominion of the Crown it is possible for a candidate to test himself in order to see whether he has attained a standard equal to that which is attained by a good English schoolboy or undergraduate.

PROF. RUDOLF TOMBO, jun., of Columbia University, has compiled an interesting set of registration statistics concerning the principal universities of the United States. The statistics are published in the issue of *Science* for December 21, 1906. Comparing the figures for 1906 with those of the preceding year, it is seen that California, Leland Stanford, Johns Hopkins, North-Western, and Columbia universities have all suffered a decrease in attendance. The greatest gains have been made by Pennsylvania, New York, Indiana, Missouri, Syracuse, Virginia, Nebraska, Ohio, Cornell, Illinois, Chicago, and Michigan universities. Harvard and Yale with a few other universities have remained stationary in numbers. Examining the numbers of students taking different faculties, most of the institutions this year show an increase in enrolment in the arts department. This is true, so far as men are concerned, of every institution in the table, with the exception of Johns Hopkins and Wisconsin, though several universities for a number of years have registered continual losses in their arts departments, these losses being in many cases due to corresponding gains in the scientific schools. Prof. Tomba says a reaction has apparently set in in this direction, at least at a number of institutions. At Princeton, for example, the number of arts students has increased from 629 to 758, at Yale from 1323 to 1350, at Columbia from 557 to 606; whereas the number of science students at the same institutions has decreased from 624 to 484 in the case of Princeton, from 1028 to 929 in the case of Yale, and from 566 to 524 in the case of Columbia. At Harvard the discrepancy is even greater. The largest gain in the number of science students has been made by Illinois (from 880 to 1020).

THE *Times* recently published some details of the work done by the London County Council Education Committee in the direction of the proper training of children on the physical side. With regard to hygiene and medical work, the head teachers of the schools are instructed to give attention to such questions as ventilation, the scrubbing of floors, and the inspection of the "offices." Children who come to school dirty are washed, or if further purification is needed they are sent home. Notification is made to the medical officer when any child attends school suffering from an infectious disease or after coming from an infected home. Defective children receive special attention, and lists are made in order that they may be medically inspected. The staff of trained medical nurses now numbers thirty-two. The nurses are constantly at work visiting the schools, where they closely examine the children, confer with the teachers, schedule the unclean and those suffering from skin diseases, and generally continue the work of the teachers in these matters. The education committee has its own medical officer, an assistant, and twenty-three other qualified medical men or women, who give a half or a quarter of their time. These medical officers, if necessary, exclude a child from school, and recommend the temporary closing of the school itself in case of extensive prevalence of infectious disease. In examining the children reported to be defective, if they find that the defect is such as to make it desirable that the child should be remitted to a "special" school, they recommend accordingly. The question of bad teeth is not overlooked. Much care is devoted to cases of defective sight. Care is exercised in seeing that no child's sight is strained, and the number of children who visit the hospitals for treatment is very large. Physical exercises, including all that modern scientific and practical experience can suggest as best fitted for the pupils, form an important part of the curriculum of every school. The exercises are health-giving, and are enjoyed by both boys and girls. Games are also encouraged and even organised by the voluntary efforts of the teachers. Most schools have their athletic clubs, and the Council is now making a new departure by providing playing grounds.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, November 15, 1906.—"Calcium as an Absorbent of Gases, and its Applications in the production of High Vacua and for Spectroscopic Research." By Frederick **Soddy.** Communicated by Prof. J. Larmor, Sec.R.S.

By means of a special electric furnace, surrounded by a porcelain tube and enclosed within a glass tube, it has been found possible to heat reagents *in vacuo*, in sealed

soft glass apparatus, to a far higher temperature than the softening point of glass. Calcium heated in this manner is, under suitable conditions, an absorbent of all the known gases, with the exception of those of the argon group. Provided the initial gas-pressure does not exceed a few millimetres of mercury, all the common gases are rapidly and completely absorbed by calcium between 700° C. and 800° C., and a vacuum attained through which the electric discharge cannot be forced. Arndt (*Ber. d. d. Chem. Gesell.*, 1904, xxxvii., 4733), in an investigation of the melting point of calcium, noticed that the calcium volatilised freely below its melting point when heated in a vacuum of 1 mm. mercury, and the vapour reacted energetically with the oxygen and nitrogen of the residual air, producing a great improvement in the vacuum. He did not investigate the behaviour of other gases.

This behaviour of calcium is all the more surprising because in ordinary circumstances it shows a great disinclination to react, and may be heated in a tube filled with air at atmospheric pressure to a very high temperature without causing much absorption. A low initial pressure of the gas and volatilisation of the metal are essential in using calcium as an absorbent. Barium and strontium behave in a manner very analogous to calcium. In the case of hydrogen and its compounds, the absorption becomes more complete, and the vacuum improves when the calcium is allowed to cool owing to the hydride possessing an appreciable tension of dissociation at the high temperature.

The high vacua readily produced by the absorption of residual gases by calcium are at least equal to the highest attained by any other process. By filling the apparatus with mercury after the action of the calcium, and compressing any residual gas several hundred times into a tiny spectrum tube, it was found that the vacuum was still so high that the spectrum tube was of high resistance and fluoresced brightly under the discharge, showing a faint hydrogen spectrum. Since argon is not absorbed, the air must be first removed from the apparatus by means of a Fleuss pump and by replacement of the last traces with some argon-free gas, before the calcium is brought into action. The condensed gases evolved from the apparatus on heating usually suffice to replace the last of the air during the mechanical exhaustion. The calcium, being a good conductor of electricity, may be readily heated to the required temperature within the sealed glass vessel by induction through the walls from an alternating circuit outside the vessel. The special feature characterising the new method is the rapid and complete absorption by the calcium of the gases condensed on the walls, and in the electrodes, &c., of the apparatus being exhausted as soon as these are expelled by heating. These gases, known technically as "film gases," consist largely of hydrogen and carbon compounds, and cause most of the difficulty experienced in practice, for they readily re-condense and introduce a kind of steady vapour pressure within the apparatus, greatly increasing the time required for exhaustion.

In the apparatus usually employed for experimental work a porcelain tube with an external screw-thread is wound with a platinum resistance wire through which a current is passed. A porcelain test-tube containing the reagent is slipped within this furnace tube, which in turn slips within a wider porcelain tube, which again slips within the external glass tube provided with platinum wires sealed through the glass for conveying the heating current. This tube is then sealed to the apparatus to be exhausted.

In one form of apparatus for heating the calcium by induction, a calcium disc is bored with central hole through which a short bundle of soft iron wires pass. Two porcelain crucible lids bored with central holes fit over the calcium disc, the ends of the iron wires projecting beyond the lids. This arrangement is slipped into a glass tube with the axis of the iron core at right angles to the length of the tube. A coil of soft iron wire is cut at one point and bobbins of wire slipped over the two ends, which are then brought opposite and close to the ends of the iron core within the glass tube. On exciting the bobbins with an alternating current of high periodicity (200 to 400 periods) a current of the order of a kiloampere is induced in the calcium disc, heating it to the required temperature.

The phenomena when successive quantities of air are admitted into an apparatus containing heated calcium are of special interest, for all but the 1 per cent. of argon is rapidly absorbed, and in this way the minimum quantity of argon necessary to carry the discharge and show a spectrum has been determined. Below 1/50 mm. argon does not conduct; at this pressure the green and orange lines are faintly visible; at 1/25 mm. the reds appear; at 1/2 mm. the spectrum tube has a resistance equivalent to an alternative air gap of 5 mm., while at 1 mm. pressure the tube is still brilliantly fluorescent. With helium, introduced into the apparatus as a mixture of oxygen with a known small quantity of helium, the tube is non-conducting to the discharge at pressures below 1/20 mm. of helium when every trace of other gases is absent. In presence of hydrogen or oxygen one-hundredth part of this amount is sufficient to show the D_3 line of the helium spectrum. The conclusion is drawn that the inert monatomic gases in the absence of every trace of polyatomic gases show a great disinclination to conduct the discharge, and this accounts for many isolated facts familiar to workers with high vacua. The rapid "running out" of spectrum tubes filled with inert gases is due, not to the absorption of these gases, but to the absorption by the electrodes of the traces of hydrogen, &c., always present initially or introduced by the electrodes (compare Skinner, *Phil. Mag.*, 1906 [vi.] 12,481). When this has occurred the pure monatomic gas no longer conducts. The fact observed by Lord Blythswood and H. S. Allen (*Phil. Mag.*, 1905 [vi.] 10,497), that an X-ray bulb may be readily exhausted from atmospheric pressure of air to a "vacuum so good that the tube had to be heated to allow the discharge to pass through it," by the use of charcoal cooled in liquid air according to the method of Sir James Dewar, at first seems inconsistent with the fact that seventeen parts per million of the air, consisting of helium and neon, remain unabsorbed, and the residual pressure must therefore be about 1/75 mm. The explanation is to be found again in the disinclination of these monatomic gases to conduct when pure. For this reason the electric discharge test of the goodness of a vacuum is altogether misleading, for with the inert monatomic gases pressures within the range of the mercury barometer appear to be high vacua. The great power of calcium in absorbing every trace of carbon dioxide, hydrogen, water vapour, hydrocarbons, &c., derived from impurities in the apparatus, and from the lubricating grease of stop-cocks, makes it a powerful aid to the methods of spectroscopic research.

Appendix.—"Results of Gauging High Vacua by the Evaporation Test." By A. J. **Berry.**

The degree of high vacua produced by different processes may be gauged by the rate of evaporation of liquid air in a Dewar vessel exhausted by the process. The same globular vessel of about 1 litre capacity, silvered internally, was exhausted (1) by the mercury pump; (2) by the use of cooled charcoal from atmospheric pressure, using two successive quantities of charcoal; (3) by cooled charcoal after the air had been first removed by a mechanical pump. It was to be expected from the conclusion drawn in the preceding paper that the degree of vacuum obtained in the second test would be much inferior, tested by the evaporation method, to that obtained in the third. The expectation was fully borne out by the experiments. The liquid air evaporated at the rate of 898 grams in four days in the vessel exhausted by the second method, which was rather faster than in the first method, when the vacuum was produced by a mercury pump. The vacuum produced by the third method was far better, 942 grams evaporating in six days, and only 610 grams in four days.

December 6, 1906.—"The Theory of Photographic Processes. Part iii. The Latent Image and its Destruction." By S. E. **Sheppard** and C. E. K. **Mees.** Communicated by Sir William Ramsay, K.C.B., F.R.S.

The authors consider that "developability" is brought about by the acceleration of reduction by preliminary treatment. The essential chemical reaction in development is

$$Ag + R'' \rightleftarrows Ag|met| + R',$$

which normally proceeds to a state of equilibrium. If now to this state of equilibrium any cause tending to lower

the metastable limit of the silver solution be introduced, then the halide becomes developable. The following substances can act as germs for a dry plate:—(*a*) silver, introduced as colloidal silver and then converted to the metallic state; (*b*) gold; (*c*) platinum; (*d*) silver sulphide; (*e*) gas ions from flame gases.

All evidence tends to the conclusion that a necessary and sufficient condition for "developability" is the production in the silver-halide grain of a new substance. The authors have accepted a chemical theory of the latent image chiefly on account of the way in which the latent image gives certain definite chemical reactions, and especially on account of the destruction of the latent image by oxidising agents. They have made an extended investigation of the destruction of the latent image by chromic acid, with especial reference to the theory of primary and secondary development put forward by Mr. Sterry in January, 1904. This theory suggests that the primary image formed by the development of the "latent" image is intensified by silver transferred from other parts of the film.

The authors found that exposed plates, dipped in chromic acid solution before development, have their γ_∞ and inertia unaltered, but the development-velocity constant, K, lowered by the action of the chromic acid adsorbed to the silver bromide. This chromic acid was destroyed by sodium sulphite, and the plates then gave a normal K. If, however, a plate was left after chromating, before development a fall in γ_∞ was found which could not be destroyed by sulphiting, and which therefore showed an absolute destruction of the latent image. Probably this action was a re-oxidation process.

The second part dealt with a peculiar action of salts of copper, iron, mercury, and uranium, which desensitise the plate, so that enormous exposures are required to produce normal results. If the plates are exposed and developed after desensitising, K and γ_∞ are found to be normal. If, however, the plates are left for a long period after exposing, then the desensitisers destroy the latent image by lowering γ_∞ in the same way as chromic acid.

The theory advanced for this action was that desensitisers act by catalysing the oxidation reaction, which is the opposite to the ordinary light reduction action, and this view was supported by experiments which showed that with copper, quinine salts, and with iron, oxalates restored the lost sensitiveness, a result analogous to that obtained for the negative catalysis of quinine in the case of the catalysis of sodium sulphite oxidation by copper salts.

The authors have also repeated the experiments of Abney and Englisch upon the failure of the Bunsen-Roscoe reciprocity law, and of the integration of intermittent exposures. The results obtained agree with those previously found. The authors consider ripening to be due to the joint action of the (*a*) formation of resonating systems; (*b*) formation of reduction product, the function of the gelatin being to form resonators and to assist in reduction.

The authors consider the formation of the latent image to be connected with the photoelectric effect, and to be due to the liberation of electrons which ionise the halide and the surrounding gas. This theory accounts for the action of dyes as sensitisers for their own region of absorption, since these electrons will ionise the halide effectually Ionisation leads to chemical reduction, resulting in the formation of a subhalide in solid solution.

PARIS.

Academy of Sciences, January 14.—M. A. Chauveau in the chair.—A comparison between chemical phenomena determined by a heating resulting from external calorific causes and those due to a heating produced by electrical actions: M. **Berthelot.** Stress is laid on the fact that changes undergone by a substance when heated by passage of an electric current cannot be entirely regarded as due to the thermal effect of the current.—The so-called artificial plants: Gaston **Bonnier.** An adverse criticism of a recent paper of M. Stéphane Leduc.—The eighth campaign of the *Princess Alice II.*: The **Prince of Monaco.** A general account of the work done on Spitsbergen in the fields of geography, hydrography, meteorology, oceanography, zoology, and physiology.—The critical points of inverse functions: A. **Hurwitz.**—The critical points of a class of functions: Georges **Rémoundos.**—The potentials of an attracting volume the density of which satisfies Laplace's equation: Tommaso **Boggio.**—The movement of liquids with high velocity through very large conduits: H. **Merczyng.** Experiments on pipes of 38 cm. and 50 cm. diameter, the water flowing at rates between 3 and 4 metres per second, gave results differing markedly from those obtained by an extrapolation from Darcy's formula. Experiments were also made on the quantities of sand carried in suspension by the water at different velocities.—The importance of the thickening of the anterior edge of the wing of the bird in flight: application to aëroplanes: E. **Seux.**—A new wireless telemechanical apparatus: G. **Gabet.**—The exact calculation of the molecular weights of gases: Daniel **Berthelot.** A comparison of the results of the application of two methods of reduction of experimentally determined gas densities to the determination of the molecular weights of hydrogen, nitrogen, carbon, and chlorine in terms of oxygen = 32.—A sulphate of chromium the acid of which is entirely hidden, and on the equilibrium of chromic solutions: Albert **Colson.** The salt, the method of preparing which is described, has the composition $Cr_2(SO_4)_3+6H_2O$. The solution of the salt reacts with barium chloride very slowly.—Dyeing and ionisation: Léo **Vignon.**—The action of silicon chloride upon chromium: Em. **Vigouroux.** These two substances react at about 1200° C., Cr_2Si_2 being formed. The properties of this silicide have already been described by MM. P. Lebeau and Figueras.—A new silicide of manganese described by M. Gin: Paul **Lebeau.** The author gives reasons to suppose that the silicide of manganese recently described as new by M. Gin is in reality impure $SiMn_2$.—A continuous apparatus for the preparation of pure oxygen for use in organic analyses: A. **Seyewetz** and M. **Poizat.** Acid solution of potassium permanganate is allowed to flow into hydrogen peroxide solution. The advantages of ease of control and purity of the gas are claimed.—The study of a case of isomerism in the oxonium combinations of Grignard and Baeyer: W. **Tschlinzeff.** An attempt to discriminate between the two formulæ suggested by Baeyer and Grignard respectively for the addition compounds of magnesium alkyl compounds and ether. Thermochemical experiments led to indecisive results, but the action of water on the substances obtained in different ways tends to support Baeyer's views.—Methylethylketone peroxide: M. **Pastureau.** Details of the preparation, properties, and reactions of methylethylketone peroxide.—The acyclic unsaturated and β-chlorethyl ketones. A method of synthesis of the 4-alkylquinolines: E. E. **Blaise** and M. **Maire.**—A method of destroying larvæ in plantations of trees: M. **Eberhardt.** A solution of formol, glycerol, and water is used, and details are given of the mode of application in different cases. The treatment has given excellent results in trees already attacked by larvæ.—A new antelope from the valley of Ituri, *Cephalophus ituriensis*: Maurice **de Rothschild** and Henri **Neuville.**—The Liriopsidæ, crustacean isopods, parasites of the Rhizocephalæ: Maurice **Caullery.**—A precaution to be taken in the observation of colours: E. P. **Fortin.** If a coloured object is subject to a constant illumination, the colour seems to differ according as the eye is or is not exposed to light. The precautions necessary on this account are indicated in the cases of coloured chemical reactions, in meteorological observations, and in the examination of paintings.—The Aptian, Gault, and Cenomanian, and on the general characters of the Lower and Middle Cretacian in the Atlas of eastern Morocco: W. **Kilian** and Louis **Gentil.**—The relations between the Tertiary strata and volcanic rocks in Anglona (Sardinia): M. **Deprat.**—The Calabrian earthquake of September 8, 1905: G. **Mercalli.**

NEW SOUTH WALES.

Linnean Society, November 28, 1906.—Mr. T. Steel, president, in the chair.—Recent travels among the aborigines of the north coast of Australia between Broome, on the north-west, and the Gulf of Carpentaria, and at Melville Island, for the purpose of ethnological and anthropological

study: Prof. **Klaatsch.** The aborigines of the northern half of the continent are more numerous than is generally supposed, and their number may be estimated as between 100,000 and 150,000. An appeal was made by the lecturer, on behalf of the northern blacks, for greater consideration in the way of a more adequate provision of reserves, and for more effective protection than the southern blacks have received in the past. Apart altogether from humanitarian questions, the demand for their more enlightened treatment is justifiable on scientific grounds alone.—Contribution to a knowledge of the flora of Australia, part v.: R. T. **Baker.** Two additions to the flora are described—*Acacia fuliginea*, an ally of *A. ixiophylla*, Benth., *A. viscidula*, A. Cunn., and *A. dictyophleba*, F.v.M. (section Plurinerves), from the Rylstone district, New South Wales; and *Callitris Morrisoni*, an unrecorded pine from West Australia, with fruits not unlike those of *C. Drummondii*; and branchlets which would pass muster for those of *C. robusta*, R.Br. An analysis of the oil of *Eucalyptus Rudderi*, Baker and Smith, is given, together with other economic notes on this species. New localities or an extended range for a number of species are recorded.—New Australian species of the family Æschnidæ (Neuroptera: Odonata): R. J. **Tillyard.** The species herein added to the Australian list form about as miscellaneous and remarkable a set of insects as it would be possible to find, and serve to show the composite character of the Australian Odonate fauna. They comprise an East Indian species, a Chilian species (*Petalia apollo*, Selys [♀], of the subfamily Cordulegasterinæ, determined by Dr. Ris, of Belgium), and three species described as new, of which one is referable to an Indian genus, and two are probably the types of new genera.—Notes from the Botanic Gardens, Sydney, No. 12: J. H. **Maiden** and E. **Betche.** The following species are described as new:—*Boronia Deanei*, in swamps between Clarence and the Wolgan, Blue Mountains, a handsome species nearest to *B. parviflora*, Sm.; *B. repanda*, formerly recorded as *B. ledifolia*, J. Gay, var. *repanda*, F.v.M.; *Toechima dasyrrhache*, a sapindaceous plant from Tintenbar, published on behalf of Prof. Radlkofer, and at his request; *Acacia accola*, from the borders of New South Wales and Queensland, nearest allied to *A. neriifolia*, A. Cunn.; and *Rottboellia truncata*, an aberrant species from Yandama, north-west New South Wales. New varieties are also described, and new records for New South Wales.—Revision of Australian Lepidoptera, iii.: Dr. A. J. **Turner.** This instalment comprises supplementary notes on families previously treated of, namely, the Syntomidæ, the Notodontidæ, and the Geometridæ. Three genera and thirty-one species are described as new.

DIARY OF SOCIETIES.

THURSDAY, JANUARY 24.

ROYAL SOCIETY, at 4.30.—Experiments on the Dark Space in Vacuum Tubes: Sir William Crookes, F.R.S.—On a New Iron Carbonyl, and on the Action of Light and of Heat on the Iron Carbonyls: Sir James Dewar, F.R.S., and Dr. H. O. Jones.—On Regeneration of Bone, Part ii., Sir William Macewen, F.R.S.—Note on the Application of Van der Waals's Equation to Solutions: The Earl of Berkeley.—On the Presence of Europium in Stars: Joseph Lunt.

ROYAL INSTITUTION, at 3.—Recent Advances in the Exploration of the Atmosphere: Dr. W. N. Shaw, F.R.S.

SOCIETY OF ARTS, at 4.30.—The Bhils of Western India: Captain E. Barnes.

INSTITUTION OF ELECTRICAL ENGINEERS at 8.—Investigations on Light Standards and the Present Condition of the High Voltage Glow Lamp: C. C. Paterson.

FRIDAY, JANUARY 25.

PHYSICAL SOCIETY, at 5.—The Strength and Behaviour of Brittle Materials under Combined Stress: W. A. Scoble.—A Spectrophotometer: F. Twyman.—Photographs of Electric Sparks: K. J. Tarrant.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Alternating-Current Commutator Motors: C. A. Ablett.

SATURDAY, JANUARY 26.

THE ESSEX FIELD CLUB (at Essex Museum of Natural History, Stratford) at 6.30.—Occurrence of the Sea Bream (*Pagellus centrodontus*) in Essex Waters: Dr. James Murie.—The Evolutionary History of Carts and Waggons: Thomas W. Reader.

MONDAY, JANUARY 28.

ROYAL GEOGRAPHICAL SOCIETY at, 8.30.—A Journey through Central Asia to Northern China: Major C. D. Bruce.

SOCIETY OF ARTS, at 8.—Gold Mining and Gold Production: Prof. J. W. Gregory, F.R.S.

LONDON INSTITUTION, at 5.—The Transmutation of Elements: Sir William Ramsay, K.C.B., F.R.S.

INSTITUTE OF ACTUARIES, at 5.—Further Notes on some Legal Aspects of Life Assurance Practice; A. R. Barraud.

TUESDAY, JANUARY 29

ROYAL INSTITUTION, at 3.—Survivals from the Past in the Plant World Prof. A. C. Seward, F.R.S.

MINERALOGICAL SOCIETY, at 8.—Experiments bearing on the Order of Crystallisation of Rock-constituents: Prof. H. A. Miers, F.R.S.—Isomorphism as illustrated by Certain Varieties of Magnetite: Prof. B. J. Harrington.—Serpentine-rock from the Tarnthaler Köpfe, Tyrol: Dr. A. P. Young.—A Simple Tabular Arrangement of the Thirty-two Crystallographic Classes: Dr. J. W. Evans.

FARADAY SOCIETY, at 8.—*Discussion on Osmotic Pressure.*—Apparatus for the Direct Measurement of Osmotic Pressure: Earl of Berkeley.—Indirect Methods of Measuring Osmotic Pressure: W. C. Dampier Whetham, F.R.S.—Osmotic Pressure from the Standpoint of the Kinetic Theory: Dr. T. Martin Lowry.

WEDNESDAY, JANUARY 30.

SOCIETY OF ARTS, at 8.—Apprenticeship: J. Parsons.

SOCIOLOGICAL SOCIETY, at 8.—Swiss Referendum as Instrument of Democracy: J. A. Hobson.

THURSDAY, JANUARY 31.

ROYAL SOCIETY, at 4.30.—*Probable Papers:* On the Two Spectra of the Elements as Evidence of the Composite Nature of the Atoms: Prof. W. N. Hartley, F.R.S.—On the Explosion of Pure Electrolytic Gas: Prof. H. B. Dixon, F.R.S., and L. Bradshaw.—On the Firing of Electrolytic Gas by a Compression Wave: L. Bradshaw.—A Recording Calorimeter for Explosions: Prof. B. Hopkinson.—On the Discharge of Negative Electricity from Hot Calcium: Dr. F. Horton.

ROYAL INSTITUTION, at 3.—Standards of Weights and Measures: Major Percy A. Macmahon, F.R.S.

FRIDAY, FEBRUARY 1.

ROYAL INSTITUTION, at 9.—The Methods of Combating the Bacteria of Disease in the Interior of the Organism: Sir Almroth E. Wright, F.R.S.

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